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भारतीय मानक

पैकेजबंदी — 500 कि. ग्राम तक डीजल इंजन की  
निर्यात पैकेजबंदी — रीति संहिता

*Indian Standard*

**PACKAGING — EXPORT PACKAGING  
OF DIESEL ENGINES UP TO 500 kg — CODE  
OF PRACTICE**

ICS 55.180 : 43.060

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Packaging Codes Sectional Committee had been approved by the Light Mechanical Engineering Division Council.

This standard aims at providing guidelines for packaging of small sized diesel engines having weight up to 500 kg for exports by sea, rail or road. Use of standard will help in development of modular packaging units for packaging of diesel engines. The standard provides guidelines a preparation of the engine for packaging; packaging of the engine, packaging of tools and accessories; use of wooden crates; shipping containers, and door to door containerized services. The standard also specifies the test procedures for evaluation of packages. These tests are divided into type tests and routine tests together with acceptance criteria. The standard also provides guidelines for use of rust-preventive methods and specifications for various packaging materials used for packaging of diesel engines. The standard will help the exporters in packing their products so that its integrity is maintained at the receiving end and the importer will not have to resort to overhauling the engines before use. The standard also provides information for labelling and marking of packages in which diesel engines have been packed.

## *Indian Standard*

# PACKAGING — EXPORT PACKAGING OF DIESEL ENGINES UP TO 500 kg — CODE OF PRACTICE

### 1 SCOPE

This standard prescribes a code of practice for the packaging of small sized diesel engines up to 20 kW rating and having a total weight up to 500 kg including all accessories for export by sea or road. The sea transport can be containerised or break-bulk cargo.

### 2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

| IS No.               | Title                                                                                                           |
|----------------------|-----------------------------------------------------------------------------------------------------------------|
| 277 : 1985           | Galvanized steel sheet (plain and corrugated) ( <i>first revision</i> )                                         |
| 401 : 1982           | Code of practice for preservation of timber ( <i>third revision</i> )                                           |
| 723 : 1972           | Steel countersunk head wire nails ( <i>first revision</i> )                                                     |
| 1153 : 1975          | Specification for temporary corrosion preventive, fluid, hard film, solvent deposited ( <i>first revision</i> ) |
| 1260 (Part 2) : 1979 | Pictorial marking for handling and labelling of goods: Part 2 General goods ( <i>second revision</i> )          |
| 1322 : 1982          | Specification for bitumen felts for water proofing and damp-proofing ( <i>third revision</i> )                  |
| 1398 : 1982          | Packing paper, water-proof, bitumen laminated ( <i>second revision</i> )                                        |
| 1503 : 1988          | Wooden packing cases ( <i>third revision</i> )                                                                  |
| 1674 : 1960          | Specification for temporary corrosion preventive fluid, soft film, solvent deposited                            |

### IS No.

### Title

|                      |                                                                                                                                                 |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 3071 : 1981          | Specification for wooden crates ( <i>first revision</i> )                                                                                       |
| 3400 (Part 2) : 1980 | Methods of test for vulcanized rubbers: Part 2 Hardness ( <i>first revision</i> )                                                               |
| 5872 : 1990          | Cold rolled steel strips (box strapings) ( <i>first revision</i> )                                                                              |
| 6263 : 1972          | Specification for VCI treated paper                                                                                                             |
| 6662 : 1980          | Specification for timber species suitable for wooden packaging ( <i>first revision</i> )                                                        |
| 7028 (Part 2) : 1988 | Performance tests for complete, filled transport packages: Part 2 Vibration test at fixed low frequency ( <i>first revision</i> )               |
| 7028 (Part 3) : 1987 | Performance tests for complete, filled transport packages: Part 3 Horizontal impact test, inclined plane and pendulum ( <i>first revision</i> ) |
| 7028 (Part 4) : 1987 | Performance tests for complete, filled transport packages: Part 4 Vertical impact drop test ( <i>first revision</i> )                           |
| 7028 (Part 5) : 1987 | Performance tests for complete, filled transport packages : Part 5 Rolling test ( <i>first revision</i> )                                       |
| 7028 (Part 8) : 1987 | Performance tests for complete, filled transport packages : Part 8 Water spray test ( <i>first revision</i> )                                   |
| 13228 : 1991         | Corrugated fibreboard boxes for packaging and transportation                                                                                    |

### 3 PRODUCT

The product is a small sized diesel engine up to 20 kW rating and having a total weight up to 500 kg including all accessories. This engine can be with a single flywheel or with two flywheels. Generally the weight is concentrated at the base of the engine.

The product is painted. There are orifices, for example, water inlet/ outlet. Components like shaft have bare metal surfaces. Components namely fuel filter and bent pipes protrude out of the main body. The main body, cylinder head and brackets holding fuel tank are made out of cast iron. The tank, body covers, air filter and silencer are made out of sheet metal.

The components namely silencer, air cleaner, handle, pulley and pipes are dismantled for convenience in packaging. A number of tools that is spanners, screw drivers, grease gun, oil can, etc, are also supplied along with each engine.

#### 4 PREPARATION OF ENGINE FOR PACKAGING

4.1 Remove water from water inlets/outlets.

4.2 Dismantle the components namely air filter, silencer bent pipes, etc, so as to reduce cubic space.

4.3 Clean the surfaces and parts requiring rust protection with appropriate solvent and remove any visible rust, formed earlier on the surfaces and parts with a rust removing compound.

4.4 The cleaned surfaces shall be free from dirt, moisture and finger prints.

4.5 Plug all the orifices for example water inlet/outlet suitably to avoid entry of dust, moisture, foreign particles, etc.

4.6 Use rust preventive methods as detailed in Annex A. Removal of lubricating oil from the sump and engine shall be at room temperature.

#### 5 PACKAGING OF ENGINE

The standard equipment namely silencer, handle, air filter and tools shall be packed suitably as detailed later. These items in packed condition shall be placed in the shipping container used for engine. The details of packaging materials are given in Annex B.

##### 5.1 Packaging Materials for Different Components

###### 5.1.1 Engine

The engine shall be covered with a low density polyethylene sheet of minimum 500 gauge thickness or similar materials of equivalent or better barrier properties and shall be sealed suitably in such a way that entry of outside air is controlled to the maximum extent possible.

###### 5.1.2 Standard Equipment

The standard equipment except the tools (which normally come in the form of a kit) should be

individually packed in bags made out of low density polyethylene (LDPE) or high molecular high density polyethylene (HDPE). The bags should be suitably closed preferably by heat sealing or twist tying.

The components namely silencer and air filter which are prone to damage due to denting shall be packed in corrugated fibre board boxes of style tuck-in-type or telescopic type. The specific requirements of corrugated fibre board (CFB) should be conforming to IS 13228 : 1991.

The box should be closed with gummed paper tape or plastic tape.

##### 5.1.3 Shipping Containers

The choice of shipping container will depend on the mode of transport. Different types of shipping containers are as listed below:

- a) Wooden case, and
- b) Wooden crate with outer sleeve and cap.

The details are as given below.

The details of wooden cases for net weight up to 250 kg are discussed on 5.1.3.1 and details of wooden cases for net weight in the range of 250 kg to 400 kg have been given in 5.1.3.2.

The details of wooden crates with outer sleeve and cap have been given in 5.1.3.3. This method of packaging is exclusively meant for door to door containerised transportation.

###### 5.1.3.1 Wooden cases for weight of contents up to 250 kg

The wooden case shall be constructed as per IS 1503 : 1988 (with necessary modifications). Additional supporting battens should be nailed on to the base from inside. The engine shall rest on these battens such that the grouting bolts pass through the supporting battens. The flywheel should rest on a supporting batten of suitable thickness and width, and its lateral movements should be arrested by means of wooden wedge shaped blocks nailed on to the supporting batten. One batten should be fixed horizontally above the flywheel to arrest its vertical movement. This batten should be arrested by means of vertical struts nailed to the sides of the pack.

The lateral movement of engine shall be arrested by means of a horizontal batten with pre-cut slot which fits onto the engine block. All the points where the engine body comes in contact with the wooden members of the case, should be lined with materials like felt or CFB or other soft cushioning media.

The skids at the base should be 50 mm thick to facilitate handling by forklift or slings.

This type of pack is suitable when transportation is by road only or in case of sea transport as break bulk cargo.

The same case can be constructed with internal battens with some modifications in the panels but (without change in base design) to reduce volume and hence freight.

#### 5.1.3.2 *Wooden case for weight of contents in the range of 250 to 400 kg*

The case shall be constructed with skid type base. The cross section of skids and headers should be 100 mm × 50 mm. IS 3071 : 1981 can be referred.

#### 5.1.3.3 *Wooden crate with outer sleeve and cap*

In case the transportation of the packed engines is by containerised transportation, wooden crates may be used. The base of the pack and inside fitments should be similar to those mentioned for packing in wooden case.

The crate can be covered externally with a rectangular sleeve and a cap made out of any suitable material such as 5 ply CFB or plastic corrugated board.

The timber should be selected as per IS 6662 : 1980 on timber suitable for packing cases. For preservative treatment IS 401 : 1982 should be referred. The moisture content should be within 12 to 18 percent.

#### 5.1.4 *Waterproofing*

Waterproofing materials are required to prevent entry of water/ moisture inside the pack. Different materials and their application methods are as given below.

##### 5.1.4.1 *Bitumen sandwiched kraft paper (see IS 1398 : 1982)*

This material of specifications 60/40/80 gm/m<sup>2</sup> (kraft/bitumen/ kraft) Type 1 should be used for:

- a) inside lining of individual panels of the wooden case. Shoe nails or staples should be used for fixing the lining material to the panel.
- b) external lining of CFB hood used as sheathing on wooden crate.

##### 5.1.4.2 *Tar felt (see IS 1322 : 1982)*

When the pack is likely to be stored in open yard; as in the case of break bulk cargo, the top of the

pack should be covered with tar felt for preventing entry of rain water inside the pack. This material shall extend by about 150 mm on sides and ends of the pack.

##### 5.1.4.3 *Galvanised steel sheet (see IS 277 : 1985)*

Galvanised steel sheet of 0.45 mm minimum thickness can be used instead of tar felt mentioned above.

#### 5.1.5 *Reinforcement*

The wooden cases should be suitably reinforced with steel straps (see IS 5872 : 1990). Minimum two straps of not less than 12 mm width and 0.4 mm thickness and suitably treated for corrosion preventive should be used.

For reinforcing corners of the pack, metal angles made out of steel strips not less than 30 mm width and 1.5 mm thickness and suitably treated for corrosion prevention should be used. Length of each arm of the metal angle shall not be less than 75 mm.

## 6 MARKING

Following details should be indicated on the pack by direct stenciling in black:

- a) Gross weight : kg
- b) Dimensions : cm × cm
- c) Rating of Engine
- d) From : kW
- e) To
- f) Marking for 'This side up' to indicate the position in which the package is to be transported
- g) Maximum number of packages that can be stacked over one other
- h) Any other information as necessary may also be marked

These letters and figures shall be at least 7.5 cm high. To facilitate handling, following pictorial marks should be stenciled in black.

- a) This way up
- b) Keep dry
- c) Do not drop
- d) Sling here
- e) Centre of gravity

These symbols may not be surrounded by border lines. Overall height of these symbols should not be less than 5 cm. For details, IS 1260 (Part 2) : 1979 may be referred.

## 7 TEST PROCEDURES FOR EVALUATION OF PACKAGE PERFORMANCE

**7.1 Type Tests** (To be conducted once a year for each design of package)

**7.1.1** Type tests shall include the following tests:

- a) Vibration Test
- b) Rolling Test
- c) Drop Test
- d) Inclined Impact Test
- e) Rain Test

**7.1.2** The tests specified in 7.1.1 shall be conducted in various combinations as specified in 7.1.3 at the intensities specified in 7.1.4.

**7.1.3** For performance testing of vibration, rolling, impact and drop, each sample should consist of three bulk packages containing the engines. The sequence of tests conducted shall be in accordance with the following schedule:

- a) The first package shall be tested for vibration, rolling and drop test,
- b) The second package shall be tested for vibration, rolling and inclined impact, and
- c) The third package shall be tested for rolling, inclined impact and drop test.

For performance of rain test, anyone of the above comparatively undamaged pack shall be used.

**7.1.4 Test Intensities**

1. Vibration tests : Package to be vibrated for 1 hour at:  
frequency : 120 cycles/min  
amplitude : 2.54 cm
2. Rolling Test : Package to be given 20 rolls along 3 different axis
3. Inclined Impact : Total 3 impacts (one Test each on two test ends

and one on body)  
(Speed of Impact : 8 km/h)

4. Drop Test : 4 sequential drops (one on any base corner, one each on two adjacent edges and one on the base)

5. Rain Test : 80-120 mts (recommended for break bulk cargo)

For detailed information refer to IS 7028 (Part 2) : 1988, IS 7028 (Part 3) : 1987, IS 7028 (Part 4) : 1987, IS 7028 (Part 5) : 1987 and IS 7028 (Part 8) : 1987.

**7.2 Routine Tests**

**7.2.1 Rolling Test**

Package shall be given 20 rolls along three different axes.

**7.2.2 Drop Test** (To be restricted to head loads only).

The package shall be dropped from a height of 1.5 metres once on the largest flat surface, once on the longest edge and once on any corner of its own.

**7.2.3 Water Spraying Test**

The package shall be allowed to be exposed against a water spray equivalent to a normal sudden monsoon shower for 5 minutes.

**7.3 Acceptance Criteria**

|                                               |                          |
|-----------------------------------------------|--------------------------|
| Vibration Test/Inclined Impact Test/Drop Test | No damage to the product |
| Rolling Test                                  |                          |
| Rain/Shower Test                              | No seepage of water      |

## ANNEX A

(Clause 4.6)

### RUST PREVENTIVE METHODS

**A-0** To prevent rust formation on the engine surface/parts during storage, following rust preventive methods may be used.

#### A-1 USE OF RUST PREVENTIVES

**A-1.1** Using VCI Coated Papers (see IS 6263 : 1972)

Volatile corrosion inhibitor coated papers may be wrapped on such parts which are prone to rusting, for example shaft. The VCI paper should conform to IS 6263 : 1972,

#### A-1.2 Use of Rust Preventive Coatings

Alternatively, the surface/parts prone to rusting may be coated with suitable rust preventive. The coatings shall be uniform throughout. IS 1674 : 1960 and IS 1153 : 1975 should be referred.

**A-2 USE OF DESICCANT**

Silica gel in bags shall be tied on the engine at different spots. The quantity should be minimum 0.7 kg per metre cube of volume (Resilient sealings

washers may be required where fixing bolts pass through the polyethylene sheet used as barrier, to ensure effective sealing of these points).

**ANNEX B****(Clause 5)****SPECIFICATIONS FOR PACKAGING MATERIALS**

- a) *Wood* : Group timber, as per IS 6662 : 1980 shall be used. In case of difficulty in getting Group I timber, Group II timber of equivalent strength should be used. Moisture content should be in the range of 12 to 18 percent. For preservative treatments, IS 401 : 1982 shall be referred.
- b) *Cover for the Engine : Material : LDPE*  
 Thickness : 500 gauge  
 W.V.T.R. : 3.0 Max  
 gm/m<sup>2</sup>/24 h  
 (at 38°C + 1°C and 90 + 2% RH)  
 Any material of similar barrier properties could be used.
- c) *Corrugated Fibre Board*  
 No. of plies : 5  
 Grammage of plies : 140/140/140/140/140/220<sup>1)</sup>  
 Type of Flute : B/B (Narrow/Narrow)  
 Direction of Flute : Vertical  
 Bursting Strength : 12  
 (Min) kg/cm<sup>2</sup> Preferably starch  
 Adhesive used based or any other  
 suitable natural  
 adhesive  
 Other details in accordance with IS 13228 : 1991
- d) *Nails* :  
 The nails should conform to IS 723 : 1972. To avoid loosening of joints, the nails should be suitably clinched.
- e) *Steel Straps*  
 Shall conform to IS 5872 : 1990.
- f) *Waterproof Paper*  
 Material : Kraft/Bitumen/Kraft  
 Grammage : 80/60/80  
 (gm/m<sup>2</sup>)  
 Shall conform to IS 1398 : 1982.
- g) *Rubber Paddings*  
 1) Hard : Material — Natural rubber having a hardness of 55-60 IRHD (see IS 3400 (Part 2) : 1980)  
 2) Soft : Material — Natural rubber hardness 15 to 20 IRHD [see IS 3400 (Part 2) : 1980]
- h) *Lining Material*  
 1) CFB  
 No. of plies : 3  
 Type of flute : B (Narrow)  
 Grammage : 140/140/140  
 2) Felt  
 Thickness : 6 mm
- j) *Tar Felt*  
 Shall conform to IS 1322 : 1982.

<sup>1)</sup>In case of water proofing requirement; the outer liner should be waterproof paper kraft/bitumen/ kraft of 80/60/80 gm/m<sup>2</sup> Type 1 (see IS 1398 : 1982).

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### Amendments Issued Since Publication

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## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002  
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha  
(Common to all offices)

### Regional Offices :

Telephone

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI 110002

{ 331 01 31  
331 13 75

Eastern : 1/14 C. I.T. Scheme VII M, V. I. P. Road, Maniktola  
CALCUTTA 700054

{ 37 84 99, 37 85 61  
37 86 26, 37 86 62

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022

{ 60 38 43  
60 20 25

Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113

{ 235 02 16, 235 04 42  
235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)  
BOMBAY 400093

{ 632 92 95, 632 78 58  
632 78 91, 632 78 92

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